



ISO9001 ISO14001 IATF16949 CHILISIN ELECTRONICS CORP.

SPECIFICATION FOR APPROVAL

Customer :

Customer P/N:

Drawing No :

Quantity :

0 Pcs. Date : 2020/11/30

Chilisin P/N :

ACTS Series

Automotive Grade Resistor

Halogen Free
RoHS Compliant
REACH Compliant
Lead Free Solders
AEC-Q200

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Drawn by
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Approved by
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ACTS Series Specification

1 Scope:

- 1-1 This specification is applicable to lead-free and halogen-free ACTS series anti-sulfurated automotive thick film chip resistors.
- 1-2 Superior Sulfur resistant capability (Refer to ASTM-B-809-95&EIA977sulfur vapor test).
- 1-3 Lead-free products refer to termination lead-free which meets RoHS requirement
However, Pb contained in glass material is exempted by RoHS directive.
- 1-4 This product is for automotive electronic application.
- 1-5 AEC-Q200 qualified ,grade 1.
- 1-6 ACTS000201 AEC-Q200 qualified ,grade 1.
Other Types AEC-Q200 qualified ,grade 0.

2 Part Numbering:

A	C	T	S	0	0	0	4	0	2	-	1	0	0	2	F	T	H
Series				Internal Code		Dimension (inch)				Resistance Value				Tolerance		Taping Code	
ACTS: Anti-Sulfurated automotive Thick Film Chip Resistor						0201				J Tol: (3 digit + X) 10Ω=100				5%: J		TH 10,000pcs/reel : 0201, 0402	
						0402											
						0603				4.7Ω=4R7				1%: F		TP 5,000pcs/reel: 0603, 0805, 1206, 1210	
						0805											
						1206				JUMPER=000				0.5%: D		TE 4,000pcs/reel: 2010, 2512	
						1210											
						2010				F /D Tol: (4 digit) 10.2Ω=10R2							
2512				10KΩ=1002													
										JUMPER=0000							

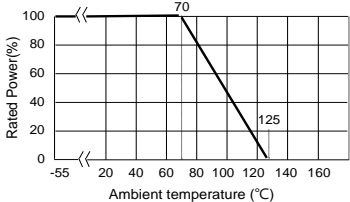
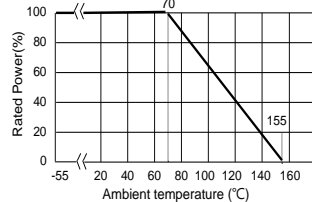
3 SPECIFICATIONS:

3.1 Resistance Range:

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R (ppm/°C)	Resistance Range		JUMPER (0Ω) Rated Current		JUMPER (0Ω) Resistance Value	
					D(±0.5%) E-24 · E-96	J(±5%) · F(±1%) E-24 · E-96	J(±5%)	F(±1%)	J(±5%)	F(±1%)
0201	1/20W	25V	50V	-200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	0.5A	0.5A	100mΩ MAX	50mΩ MAX
				+400	10Ω ≤ R ≤ 10MΩ	10Ω ≤ R < 10MΩ				
0402	1/16W	50V	100V	±200	-----	1Ω ≤ R < 10Ω	1A	1.5A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 22MΩ				
0603	1/10W	75V	150V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	1A	2A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 22MΩ				
0805	1/8W	150V	300V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	2A	2.5A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 27MΩ				
1206	1/4W	200V	400V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	2A	3.5A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 27MΩ				
1210	1/2W	200V	400V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	2A	4A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 27MΩ				
2010	3/4W	200V	400V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	2A	5A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 20MΩ				
2512	1 W	200V	400V	±200	1Ω ≤ R < 10Ω	1Ω ≤ R < 10Ω	2A	7A	100mΩ MAX	50mΩ MAX
				±100	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R < 20MΩ				
Operating Temperature Range				-55°C ~ +155°C (0201: -55°C ~ +125°C)						

ACTS Series Specification

3.2 Power Derating Curve:

Type	0201	Other
Operating Temperature Range	-55°C ~ +125°C	-55°C ~ +155°C
Explain	If the ambient temperature exceeds 70 degrees centigrade to 125 degrees centigrade, the power can be modified by the curve as below.	If the ambient temperature exceeds 70 degrees centigrade to 155 degrees centigrade, the power can be modified by the curve as below.
Figure		

3.3 Voltage Rating :

Rated Voltage: DC voltage or AC voltage (rms) based on the rated power.

The voltage can be calculated by the following formula. If the calculated value exceeds the Max. voltage specified in the Table 3, the Max. Voltage rating is set as the voltage rating.

$$E = \sqrt{R \times P}$$

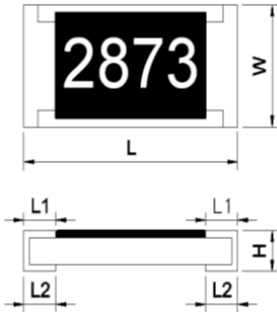
E= Voltage ratinge (v)

P= Power rating (w)

R= Nominal resistance(Ω)

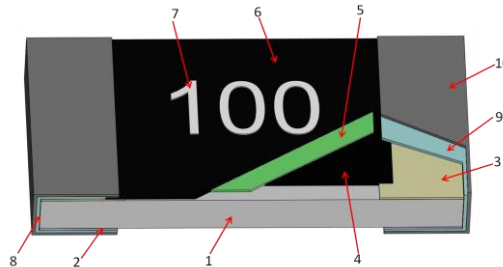
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4 Dimensions:



Dimension Type	L	W	H	L1	L2
ACTS_0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
ACTS_0402	1.00±0.10	0.50±0.05	0.30±0.05	0.20±0.10	0.25±0.10
ACTS_0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.15	0.30±0.15
ACTS_0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
ACTS_1206	3.05±0.10	1.55±0.10	0.50±0.10	0.45±0.20	0.35±0.20
ACTS_1210	3.05±0.10	2.55±0.10	0.55±0.10	0.50±0.20	0.50±0.20
ACTS_2010	5.00±0.20	2.50±0.20	0.60±0.10	0.65±0.20	0.65±0.20
ACTS_2512	6.30±0.20	3.20±0.20	0.60±0.10	0.65±0.20	0.65±0.20

5 Structure Graph:



1	Ceramic substrate	6	2nd Protective coating
2	Bottom inner electrode	7	Marking
3	Top inner electrode	8	Terminal inner electrode
4	Resistive layer	9	Ni plating
5	1st Protective coating	10	Sn plating



ACTS Series Specification

6 Reliability Test:

No	Item	Conditions	Specifications																												
			Resistors	Jumper																											
1-1	High Temperature Exposure (Storage)	Put the specimens in the chamber with temperature of 155±3°C for 1000 hours. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Experiment evidence: AEC-Q200	1. 1% : ΔR= ± 1.0% 2. 5% : ΔR= ±2.0%	Refer to item 3. general specifications																											
1-2	Temperature Cycling	Put the specimens in the High & low temperature test chamber with temperature varies from -55°C to 125°C for 5 minutes and total 1000 cycles. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Experiment evidence: AEC-Q200	ΔR= ±2.0% No mechanical damage.	Refer to item 3. general specifications																											
1-3	Biased Humidity	Solder the specimens on the test PCB and put them into the constant temperature humidity chamber with 85±2°C and 85±5%RH. Then apply the test voltage that calculates based on the 10% of rated power for 1000hrs. Then take them out to stabilize in room temperature . for 24±4hr or more, and measure of its resistance variance rate Experiment evidence: AEC-Q200	1. 1% : ΔR= ±2.0% 2. 5% : ΔR= ±3.0% No mechanical damage, short or burning-out phenomenon.	Refer to item 3. general specifications																											
1-4	Operational Life	Solder the specimens on the test PCB and Put them in the chamber with temperature of 125±3°C and load the rated voltage for 1000 hours. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Note: The input voltage shall refer to the power derating curve (referring to Table.3.1) Experiment evidence: AEC-Q200	1. 1% : ΔR= ±2.0% 2. 5% : ΔR= ±3.0% No mechanical damage, short or burning-out phenomenon.	Refer to item 3. general specifications																											
1-5	Short Time Overload	Applied 2.5 times rated voltage for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated voltage refer to item 3. general specifications) Jumper : Applied Maximum overload current <table border="1" style="font-size: small;"> <tr> <td>Type</td> <td>(0201)</td> <td>(0402)</td> <td>(0603)</td> <td>(0805)</td> <td>(1206)</td> <td>(1210)</td> <td>(2010)</td> <td>(2512)</td> </tr> <tr> <td>Jumper</td> <td>±5% : 1.25A</td> <td>2.5A</td> <td>2.5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> <td>5A</td> </tr> <tr> <td></td> <td>±1% : 1.25A</td> <td>3.75A</td> <td>5.0A</td> <td>6.25A</td> <td>8.75A</td> <td>10.0A</td> <td>12.5A</td> <td>17.5A</td> </tr> </table> Refer to JIS-C5201-1 4.13	Type	(0201)	(0402)	(0603)	(0805)	(1206)	(1210)	(2010)	(2512)	Jumper	±5% : 1.25A	2.5A	2.5A	5A	5A	5A	5A	5A		±1% : 1.25A	3.75A	5.0A	6.25A	8.75A	10.0A	12.5A	17.5A	1. 1% : ΔR= ±1.0% 2. 5% : ΔR= ±2.0% No evidence of mechanical damage. No short or burned on the appearance.	Refer to item 3. general spec
Type	(0201)	(0402)	(0603)	(0805)	(1206)	(1210)	(2010)	(2512)																							
Jumper	±5% : 1.25A	2.5A	2.5A	5A	5A	5A	5A	5A																							
	±1% : 1.25A	3.75A	5.0A	6.25A	8.75A	10.0A	12.5A	17.5A																							
1-6	Resistance to Soldering Heat	The specimens are fully immersed into the Pb-free solder pot, then take them out to stabilize for 1 hour or more and measure of its resistance variance rate. Temp of solder pot : 260±5°C Soldering duration : 10±1sec. Experiment evidence AEC-Q200	ΔR= ±1.0% No cosmetic defect on terminal or peel-off of side end.	Refer to item 3. general specifications																											
1-7	ESD	Put the specimens on the test fixture and two (2)discharges (2KVDC) shall be applied to each PUT, one (1) with a positive polarity and one (1) with a negative polarity. Afterwards, the specimens stabilize for 30min or more and measure of its resistance variance rate. The test is performed with direct contact and regular discharge mode. The resistor and capacitor used on the spearhead is 2000Ω and 150pF respectively. Experiment evidence AEC-Q200	ΔR= ±3.0% No mechanical damage, short or burning-out phenomenon.	Refer to item 3. general specifications																											



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ACTS Series Specification

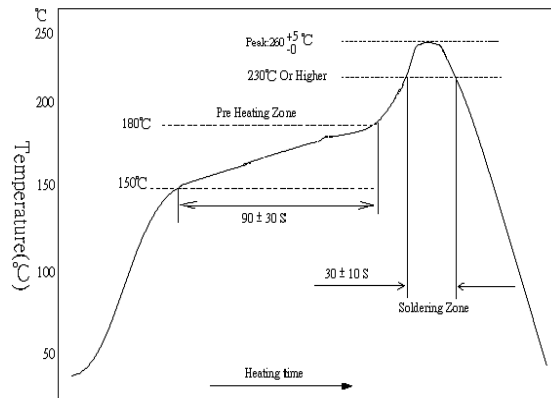
No	Item	Conditions of Test	Specifications	
			Resistors	Jumper
1-8	Solderability	Test method: Test item 1 (solder pot test): Method B Precondition: The specimens are subjected to 155°C dry bake for 4hrs±15min. The specimens are immersed into the flux first, then fully immersed into the solder pot, at a temperature of 235±5°C for 5+0/-0.5 sec. Then rinse with water and observe the soldering coverage under the microscope. Test item 2 (Leaching test): Method D The specimens are immersed into the flux first, then fully immersed into the solder pot, at a temperature of 260±5°C for 30+0/-0.5 sec. Then rinse with water and observe the soldering coverage under the microscope. Experiment evidence AEC-Q200	1.Soldering coverage over 95% 2.At the edge of terminal, the object underneath (e.g. white ceramic) shall not expose.	
1-9	Electrical Characterization	$TCR (ppm / ^\circ C) = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10^6$ R1: Resistance at room temperature (Ω) R2: Resistance at -55°C or +125°C (Ω) T1: Room temperature (°C) T2: Temperature -55°C or +125°C	Refer to item 3. general specifications	NA
1-10	Board Flex (Bending Test)	Solder the specimens on the test PCB and put the PCBA onto the Bending Tester. Add force at the central part of PCB, and the duration of the applied forces shall be 60 (+5) Sec. Measure of its resistance variance rate in load. Bending depth D: = 5mm Experiment evidence: AEC-Q200	$\Delta R = \pm 1.0\%$ No mechanical damage, peel-off of side end or chip crack.	Refer to item 3. general specifications
1-11	Sulfuration Test	Put the tested resistor in sulfur vapor, at a temperature of 105±2°C for 750hrs Refer to ASTM-B-809-95 & EIA977	$\Delta R = \pm 4.0\%$	Refer to item 3. general specifications

ACTS Series Specification

7 Technical application notes: (This is for recommendation, please customer perform adjustment according to actual application)

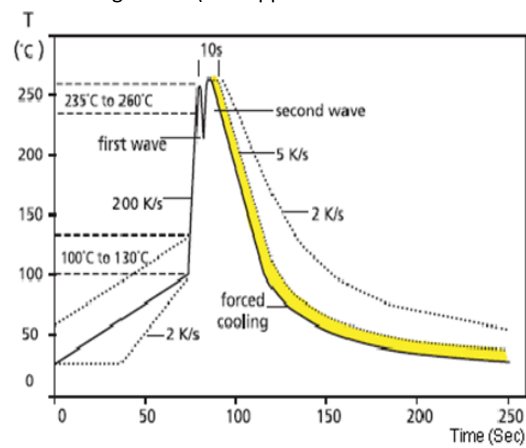
7.1 Recommend soldering method:

7.1.1 Lead Free IR Reflow Soldering Profile



Remark: The peak temperature of soldering heat is 260 +5/-0 °C for 10 seconds

7.2 Lead Free Double-Wave Soldering Profile.(This applies to 0603 size inclusive above products)

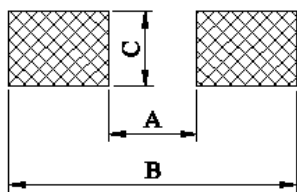


7.3 Soldering Iron: temperature 350°C ±10°C , dwell time shall be less than 3 sec.

ACTS Series Specification

8 Recommend Land Pattern:

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



Unit : mm

TYPE \ DIM	A	B	C
0201	0.3	1	0.4
0402	0.5	1.5	0.6
0603	0.8	2.1	0.9
0805	1.2	3	1.3
1206	2.2	4.2	1.6
1210	2.2	4.2	2.8
2010	3.5	6.1	2.8
2512	3.8	8	3.5

8.2 Environment Precautions:

This specification product is for general electronic use, CHILISIN will not be responsible for any damage, cost or loss caused by using this specification product in any special environment. If other applications need to confirm with CHILISIN.

If consumer intends to use our Company product in special environment or condition (including but not limited to those mentioned below), then will need to make individual recognition of product features and reliability accordingly.

- Used in high temperature and humidity environment
- Exposed to sea breeze or other corrosive gas, such as Cl₂、H₂S、NH₃、SO₂ and NO₂.
- Used in non-verified liquids including water, oil, chemical and organic solvents.
- Using non-verified resin or other coating material to seal or coat our Company product.
- After soldering, it is necessary to use water-soluble detergents to clean residual solder fluxes, even though no-clean fluxes are recommended.

8.3 Momentary Overload Precautions:

The product might be out of function when momentary overloaded.

Please make sure to avoid momentary overloading while using and preserving °

ACTS Series Specification

8.4 Operation and Processing Precautions:

- (a) Avoid damage to the edge of resistor and protective layer caused by mechanical stress.
- (b) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.
- (c) Make sure the power rating is under the limit when using the resistor. When power rating is over the limit, the resistor will be overloaded. There might be machinery damage due to the climbing temperature.
- (d) If the resistor will be exposed under massive impact load (shock wave) in a short period of time, the working environment must be set up well before use.
- (e) Please make evaluation and confirmation when the product is well used in your company and have a through consideration of it's fail-safe design to ensure the system safety.

9 Storage and transportation requirement:

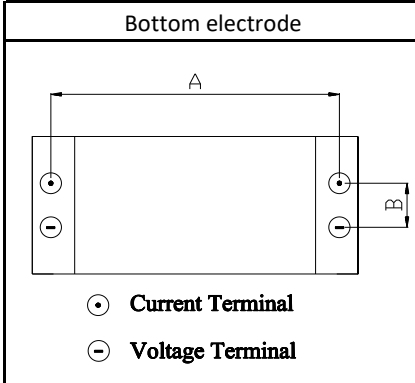
- 1.1 The temperature condition must be controlled as $25\pm 5^{\circ}\text{C}$, the R.H. must be controlled as $60\pm 15\%$. The stock can maintain quality level in two years.
- 1.2 Please avoid the mentioned harsh environment below when storing to ensure product performance and its' weldability. Places exposed to sea breeze or other corrosive gas, such as Cl_2 、 H_2S 、 NH_3 、 SO_2 and NO_2 .
- 1.3 When the product is moved and stored, please ensure the correct orientation of the box. Do not drop or squeeze the box. Otherwise, the electrode or the body of the product may be damaged.

10 Plating Thickness:

- 9.1 Ni: $\geq 2\mu\text{m}$
- 9.2 Sn(Tin): $\geq 3\mu\text{m}$
- 9.3 Sn(Tin): Matte Sn

11 Measurement Point:

Bottom electrode		Unit : mm	
TYPE	DIM	A	B
	0201		0.44 ± 0.05
0402		0.80 ± 0.05	0.24 ± 0.05
0603		1.35 ± 0.05	0.35 ± 0.05
0805		1.80 ± 0.05	0.35 ± 0.05
1206		2.90 ± 0.05	0.35 ± 0.05
1210		2.90 ± 0.05	0.35 ± 0.05
2010		4.50 ± 0.05	1.15 ± 0.05
2512		5.90 ± 0.05	1.60 ± 0.05





⊕ Current Terminal
 ⊖ Voltage Terminal

ACTS Series Specification

12 Stock period:

The temperature condition must be controlled at $25\pm 5^{\circ}\text{C}$, the R.H. must be controlled at $60\pm 15\%$. The stock can maintain quality level in two years.

13 The carton packaged for electronic-information products is made by the symbol as follows : (For china)

	
Marking for control of pollution cause by electronic-information products	Marking for package recovery



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ACTS Series Specification

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↵

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